

# Instruction and Technical Manual

## A

**General safety instructions  
&  
Chemical resistance table**



# INDEX

## **Part One (This Section must be read and utilised for safety)**

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- General Safety . . . . . 3
- Installation . . . . . 4
- Operation . . . . . 6
- Cleaning . . . . . 7
- Fault Finding . . . . . 8
- Chemical Resistance Tables . . . . . 9

## **Part Two**

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### **EB Range:**

- Operating Manual . . . . . 14
- User Manual . . . . . 15
- Circuit Board diagrams . . . . . 16
- General Technical Information . . . . . 18

## **Part Three**

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### **1000 Series:**

- Operating Manual . . . . . 22
- Troubleshooting Guide. . . . . 23
- Circuit Board diagrams . . . . . 27
- General Technical Information . . . . . 32

## **Part Four**

---

### **2000 Series, K Series and KR Series:**

- Operating Manual . . . . . 38
- Troubleshooting Guide. . . . . 39
- Operating Manual KR Series (Refrigerated) . . . . . 40
- Troubleshooting Guide. . . . . 41
- Circuit Board diagrams . . . . . 42
- General Technical Information . . . . . 48
- Test 13/16 Via LED Display . . . . . 54

# **Part One**

## **Introduction - General Safety**

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Centurion Scientific centrifuges are designed to be used in the laboratory environment for spinning and separating various liquids having a specific gravity of up to 1.2 sg. The instrument uses appropriate centrifuge tubes specifically designed for the rotor supplied with it and only tubes of this type may be used. It is important to note that the centrifuge is specifically designed to perform the function stated above and not for any other purpose.

Centurion Scientific centrifuges are manufactured to the highest current technical standards and regulations, and are designed for long and reliable operation. However, the user must be aware of the fact that any centrifuge may pose a danger if they are improperly used.

In particular the following points must be followed at all times:

- The centrifuge must only be used as designed and not for any other purpose.
- The centrifuge must only be operated by trained personnel, familiar with equipment of this type.
- The design of the centrifuge or its accessories must, under no circumstances, be modified without consultation with, and the written approval of Centurion Scientific.
- Most importantly, all safety instructions and procedures must be adhered to at all times. Therefore, any person concerned with the operation or maintenance of the centrifuge must read and follow all safety instructions.

In addition, all statutory regulations regarding machinery of this type and its usage must be adhered to.

## **2. Usage**

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The centrifuge is designed to separate materials having different densities and particle size respectively. The maximum sample density is 1.2g/cm<sup>3</sup> at the maximum operating speed.

To ensure that the centrifuge is operated in a safe manner, avoiding the hazard of injury to personnel or damage to material goods, the following safety precautions should be followed at all times:

- The centrifuge must only be opened by trained personnel competent in its use.
- Never use the centrifuge unless the rotor is properly mounted and secure.
- Never open, or attempt to open the lid while the centrifuge rotor is still turning.
- Only use original parts for the centrifuge.
- Never operate the centrifuge if components are missing or damaged.
- If the rotor shows visible signs of wear its use must be discontinued and a replacement fitted.
- The motor must not be overloaded, the maximum allowed density of samples at full operating speed is 1.2g/cm<sup>3</sup>
- Always endeavour to make sure that opposite tubes are of the same weight to avoid rotor imbalance. If the tubes are filled with the same material they must, therefore, be filled with the same amount.
- No changes should be made to the mechanical or electrical components without prior consultation with and the written permission of Centurion Scientific.

### **2.1 Hazardous materials - Special precautions**

- The centrifuge has not been manufactured from inert materials or to be explosion proof. Ensure that it is not operated within an environment, or with materials that make these a requirement.
- During operation a 'safe' zone of 30cm must be maintained around the centrifuge. This zone should be clear of personnel and hazardous materials at all times during the run.

- Substances of a radioactive, flammable or explosive nature must not be centrifuged.
- Substances prone to react briskly with each other must not be centrifuged at the same time.
- Toxins and pathogenic micro-organisms must not be centrifuged unless the proper precautions for their handling have been taken. These may include, but are not limited to, biological seals. Should toxins or pathogens enter the centrifuge or its parts the proper procedures for disinfecting the centrifuge should be carried out (refer to section 5)
- Strongly corrosive substances that may cause damage to or impair the mechanical strength of the rotor may only be centrifuged inside protective vessels. Should any doubt exist regarding the substance or the suitability of a particular vessel for use with it, consult the Safety Inspector.

## **3 Installation**

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The instrument has been designed in such a way that installation should present no problems to a technician familiar with equipment of this type. Should any problems or questions arise during the installation of the instrument please refer to Centurion Scientific for advice. During installation the record for the individual centrifuge (to be found with your manual) must be completed.

### **3.1 Work surface**

The work surface must be stable and, where possible, resonance free - a standard laboratory bench is usually suitable. The location of the centrifuge should be well ventilated and out of direct sunlight, having sufficient room to allow air to circulate around it freely. A safety zone extending for 30cm in all directions must be maintained around the centrifuge. This space should be kept clear; in particular no hazardous materials may be placed in the area during centrifugation.

### **3.2 Unpacking the centrifuge**

Upon receipt of the instrument please carefully examine the packaging for any signs of damage that may have occurred during transit. The instrument should be place on a flat surface, the right way up, and all the unpacking be carried out from the top in the following order:

Remove and unpack the box containing the rotor.

Remove and unpack the bag containing the IEC Mains Set and tools.

Finally remove the centrifuge. Due to its weight, care must be taken when lifting the centrifuge on to the work surface.

Check the contents against the following parts list and contact your supplier if there are any discrepancies.

### **3.3 Parts list**

- 1 x centrifuge
- 1 x rotor (as supplied)
- 1 x washer
- 1 x screw
- 1 x allen key or box spanner (fixing rotor)
- 1 x emergency lid release allen key
- 1 x IEC Mains Cord set
- 1 x manual

### **3.4 Mains connection**

Before connecting the unit to the mains, ensure that the voltage and frequency of supply match the specifications on the instrument.

A mains plug, provided with a 5 amp fuse (or 13 amp for refrigerated units), and of a type suitable for use where the centrifuge is to be installed, should be fitted. This plug must be wired up according to the international convention as follows:

BROWN Live

BLUE Neutral

GREEN/YELLOW Earth

### **3.5 Rotor assembly**

The rotor assembly locates on to the tapered shaft of the drive shaft, being held securely in position by a flat washer and a locking screw. It is important that these items are assembled in the correct order and that the washer is used as intended.

To locate the rotor first, check that both the exterior surface of the shaft and the tapered bore of the rotor itself are free from dirt or any foreign debris. The rotor should then be lowered into position on the tapered shaft, care being taken to ensure that it seats firmly and evenly. The flat washer followed by the screw is then placed into the threaded portion of the shaft, the assembly then being secured by the screw. The screw should be hand tightened with the key provided.



Rotor screw fixing



Rotor bolt fixing

## 4. Operation

### 4.1 Filling and loading the sample tubes

The centrifuge functions in the most efficient manner when unbalance of the rotor is minimised. This prevents undue vibration perturbing the separation zones of the substance being centrifuged. It is therefore important that unbalance due to loading unequal loading of the sample tubes is minimised as far as possible.

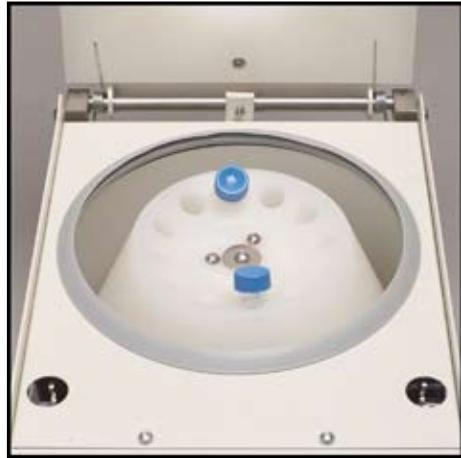
The maximum permissible imbalance of the rotor is 1g.

Imbalance may be minimised by following a few simple and quick procedures as described in the following paragraphs.

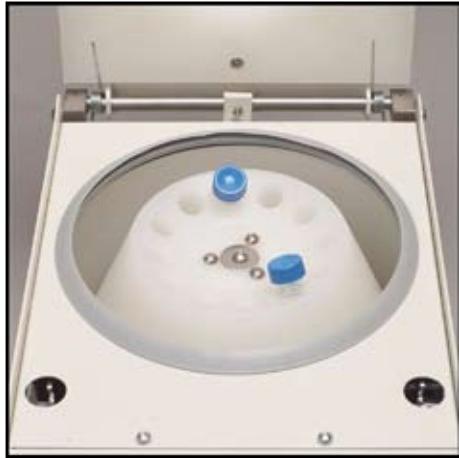
- The sample tubes should be filled as evenly as possible. Where practical, tubes containing the same substance should be placed opposite each other.
- The rotor should be loaded symmetrically, this being best achieved by using all of the bores. When only partially loading the rotor it must be ensured that opposite bores always receive tubes of the same weight.

The following pictures provide examples of correct and incorrect loading of the rotor.

CORRECT



INCORRECT



### 4.2 To load samples

Press the LID OPEN button. This will unlock the lid and allow it to pop open.

Load the samples to be centrifuged into the rotor. The load must be distributed as evenly as possible to avoid rotor imbalance (refer to section 4.1).

Shut the lid. This will lock automatically.

Check that the speed and time settings are as required. If they are not, refer to section 4.5 and change them to the desired values.

Press START. The centrifuge will now run up to operational speed and centrifugation will commence. Once the set time has elapsed the centrifuge will automatically rundown, apply the brake and stop.

After the rotor has come to rest and the safety timer has expired the message OPEn will be displayed (not on EB series). The LID OPEN button may be pressed and the samples removed.

NOTE: The lid will not open until the rotor has come to a stop and the Safety Timer has expired. If the lid does not open when the LID OPEN button is pressed, wait for a few seconds and try again.

#### **4.3 Emergency Lid Release in case of Lid Lock failure.**

In the unlikely event of the lid lock failing and the user being unable to remove their samples, an emergency lid release tool is provided.

**WARNING: OPERATION OF THE EMERGENCY LID RELEASE MUST ONLY BE UNDERTAKEN BY QUALIFIED AND APPROVED PERSONNEL.**

**UNDER NO CIRCUMSTANCES MAY THE CENTRIFUGE BE OPERATED IN THIS CONDITION.**

Wait until the rotor has stopped turning (view through the lid port) and switch off the power to the centrifuge.

Take the lid release key (supplied) and insert into the hole on the right side of the centrifuge. Push down and the lid will release.

**WARNING: UNDER NO CIRCUMSTANCES MUST THE EMERGENCY LID RELEASE BE USED WHILE THE CENTRIFUGE IS RUNNING.**

### **5. Cleaning, Disinfecting and Maintenance**

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**WARNING: Isolate and disconnect the power supply before carrying out cleaning or maintenance.**

#### **5.1 Centrifuge Body**

- Regularly wipe down the external surfaces with a mild detergent.
- Mop up any spillage with an absorbent cloth. Check to ensure that the liquid has not entered the main body of the centrifuge.

WARNING: If any liquid has entered the main body of the centrifuge it **MUST NOT** be used. Contact the supplier or Centurion Scientific Ltd immediately for advice.

#### **5.1 Rotor**

- Remove the locking screw with the key provided
- Remove the flat washer
- Pull the rotor off the shaft by applying equal force on both sides

NOTE: If any stiffness or difficulty is experienced when attempting to remove the rotor this may be overcome by applying a sharp tap to the rotor shaft. A non-metallic object (e.g. plastic mallet) must be used to prevent damage to the shaft.

- Clean the rotor using a suitable detergent and hot water. Alternatively the rotor may be cleaned in an autoclave at a maximum temperature of 120°C.
- Thoroughly rinse and dry the rotor.
- Inspect the rotor for any hairline cracks, damage or other defects. If any are found please contact your supplier or Centurion Scientific Ltd.

## **6. Speed to Rcf (G Force) Conversion**

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$$1.118 \times \text{RADIUS} \times \frac{\text{SPEED}^2}{1000}$$

Please note that the 2000 Series, the K Series and the KR Series centrifuges have an automatic converter for Speed to Rcf.

## **7. Fault finding, also use Test13/16 page 54 (Not EB Series)**

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The following tables cover the more common problems that may be rectified by the user. In the event of a problem being encountered which is not specifically covered in the following table it should be referred to the nearest authorised service centre.

FAULT	OTHER SYMPTOMS	POSSIBLE CAUSE AND REMEDIAL ACTION
Display remains dark	Motor stops Rotor stops without braking The lid cannot be opened	Mains failure or mains not connected. 1. Check Mains connection. 2. Check power is available at the Mains. If Mains supply is ok, refer to Service Department.
Display fails briefly	Motor stops suddenly Rotor stops without braking Display reads 'hello' briefly	Brief interruption of Mains supply. 1. Ensure that Mains supply plug is properly inserted. 2. Restart the centrifuge.
Lid cannot be opened	Pressing the OPEn button has no effect	Lid not correctly closed or lid warped. 1. Press lid down in the middle of the front section. Heat monitor relays in the lid unlacing magnets have been actuated (due to repeated pressing of LID button within a few seconds). 1. Wait for a short time and try again.
Excessive noise	Centrifuge is extremely noisy during operation	1. Stop the centrifuge. 2. Wait until rotor is at a standstill. 3. Open the centrifuge and check that the rotor is correctly loaded. 4. Check that there are no broken vessels, signs of damage to the rotor or motor malfunction. Rectify any defects that are found. 5. Refer the problem to the Service Department.
Rotor does not start		1. Remove Mains plug, check Mains supply is correct and replace plug. 2. Check the unit is being operated correctly. 3. If error persists, contact Service Department.
Power failure	No braking current Drive out of order Rotor stops without braking	Lid opened during a run. 1. Wait until rotor has come to a complete stop. Disconnect Mains supply and then reconnect. If error persists contact Service Department. Motor overheated 1. Room temp too high or insufficient ventilation for the motor. Disconnect mains and wait for 30 minutes. 2. Check that all cooling vents are clear and clean with a small brush.  Reconnect Mains and try again
Lid? Appears in display	Motor stops Rotor stops without braking	Lid lock mechanism out of order. 1. Press the lid tightly shut. 2. If error persists, contact Service Department
OPEn appears in the display although lid is closed	Centrifuge will not start	Control lid lock mechanism. Check that the lock is engaged on both sides. Contact the Service Department.

# CHEMICAL RESISTANCE TABLE

## KEY:

S - Satisfactory  
 M - Moderate attack  
 U - Unsatisfactory

	Aluminium	Anodic coating for Aluminium	Delrin	Glass	Polypropylene	Stainless steel
Chemical						
Acetaldehyde	S	-	-	-	M	-
Acetic Acid (5%)	S	S	M	S	S	S
Acetic Acid (60%)	S	S	U	S	S	M
Acetic Acid (Glacial)	S	S	U	S	S	M
Acetone	M	S	M	S	S	M
Acetonitrile	S	S	S	S	M	S
Alconox	U	U	S	S	S	S
Allyl Alcohol	-	-	S	-	S	-
Aluminium Chloride	U	U	U	S	S	U
Ammonium Acetate	S	S	S	S	S	S
Ammonium Carbonate	S	S	S	S	S	S
Ammonium Hydroxide (28%)	U	U	M	S	S	S
Ammonium Hydroxide (conc.)	-	-	M	-	S	S
Ammonium Phosphate	U	-	S	S	S	M
Ammonium Sulphate	U	M	U	S	S	M
Amyl Alcohol	S	-	S	-	S	-
Aniline	S	S	S	S	S	S
Aqua Regia	U	-	U	-	U	-
Barium Salts	M	U	S	S	S	M
Benzene	S	S	M	S	M	S
Benzyl Alcohol	S	-	M	-	U	-
Boric Acid	U	S	U	S	S	S
N-Butyl Alcohol	S	-	S	-	S	-
N-Butyl Phthalate	S	S	S	S	U	M
Calcium Chloride	M	U	S	S	S	S
Calcium Hypochlorite	M	-	M	-	S	U
Carbon Tetrachloride	U	U	M	S	S	M
Cesium Acetate	M	-	S	S	S	M
Cesium Bromide	M	S	S	S	S	S
Cesium Cholride	M	S	S	S	S	M
Cesium Formate	M	S	S	S	S	M
Cesium Iodide	M	S	S	S	S	M
Cesium Sulfate	M	S	S	S	S	M
Chloroform	U	U	M	S	M	M
Chromic Acid (10%)	M	-	U	S	S	U

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## KEY:

S - Satisfactory

M - Moderate attack

U - Unsatisfactory

	Aluminium	Anodic coating for Aluminium	Delrin	Glass	Polypropylene	Stainless steel
Chemical						
Chromic Acid (50%)	U	-	U	-	S	-
Citric Acid	S	-	M	-	S	-
Cresol Mixture	S	-	S	-	M	-
Cyclohexane	S	-	S	-	M	-
Deoxycholate	S	-	S	-	S	-
Dextran	M	-	S	-	S	-
Diethyl Ether	S	-	S	-	U	-
Diethyl Ketone	S	-	M	-	M	-
Diethylpyrocarbonate	S	-	S	-	S	-
N-N-Dimethylformamide	S	-	S	-	S	-
Dimethylsulfoxide	S	-	S	-	S	-
Dioxane	M	-	M	-	M	-
Distilled Water	S	-	S	-	S	-
Ethyl Acetate	M	-	M	-	S	-
Ethyl Alcohol (50%)	S	-	M	-	S	-
Ethyl Alcohol (95%)	S	-	M	-	S	-
Ethylene Dichlorine	-	-	S	-	U	-
Ethylene Glycol	S	-	S	-	S	-
Ethyloene Oxide Vapor	S	-	-	-	S	-
Ferric Chloride	-	-	M	-	S	-
Ficoll-Hypaque	M	-	S	-	S	-
Formaldehyde (40%)	M	-	S	-	S	-
Formic Acid (100%)	-	-	U	-	S	-
Gluanidine Hydrochloric	U	-	S	-	S	-
Glutaraldehyde	S	-	S	-	S	-
Glycerol	M	-	S	-	S	-
Haemo-Sol	S	-	S	-	S	-
Hexane	S	-	S	-	S	-
Hydrochloric Acid (50%)	U	-	U	-	S	-
Hydrochloric Acid (conc.)	-	-	U	-	S	-
Hydrofluoric Acid (10%)	-	-	U	-	S	-
Hydrofluoric Acid (50%)	-	-	U	-	S	-
Hydrogen Peroxide (3%)	S	-	S	-	S	-
Hydrogen Peroxide (10%)	U	-	U	-	S	-
Idoacetic Acid	S	-	S	-	S	-

# CHEMICAL RESISTANCE TABLE

KEY:

S - Satisfactory  
 M - Moderate attack  
 U - Unsatisfactory

	Aluminium	Anodic coating for Aluminium	Delrin	Glass	Polypropylene	Stainless steel
Chemical						
Isobutyl Alcohol	M	-	S	-	S	-
Isopropyl Alcohol	M	-	S	-	S	-
Kerosene	S	-	S	-	M	-
Lactic Acid (20%)	-	-	-	-	S	-
Lactic Acid (100%)	-	-	-	-	S	-
Magnesium Chloride	M	-	S	-	S	-
Mercaptoacetic Acid	U	-	S	-	U	-
2-Mercaptoethanol	S	-	S	-	S	-
Metrizamide	M	-	S	-	S	-
Methyl Alcohol	S	-	M	-	S	-
Methyl Ethyl Ketone	S	-	M	-	S	-
Methylene Chloride	U	-	S	-	U	-
Nickel Salts	M	-	-	-	S	-
Nitric Acid (10%)	M	-	U	-	S	-
Nitric Acid (50%)	M	-	U	-	M	-
Nitric Acid (95%)	M	-	U	-	M	-
Oils (Petroleum)	S	-	S	-	M	-
Oils (other)	S	-	S	-	S	-
Oleic Acid	S	-	U	-	S	-
Oxalic Acid	M	-	U	-	S	-
Perchloric Acid (10%)	U	-	U	-	S	-
Perchloric Acid (70%)	U	-	U	-	M	-
Phenol (5%)	M	-	M	-	S	-
Phenol (50%)	U	-	M	-	S	-
Phosphoric Acid (10%)	U	-	U	-	S	-
Phosphoric Acid (conc.)	-	-	U	-	S	-
Physiologic Media	M	-	S	-	S	-
Picric Acid	S	-	S	-	S	-
Potassium Bromide	U	-	S	-	S	-
Potassium Carbonate	M	-	S	-	S	-
Potassium Chloride	U	-	S	-	S	-
Potassium Hydroxide (5%)	U	-	M	-	S	-
Potassium Hydroxide (conc.)	U	-	M	-	S	-
Potassium Permanganate	S	-	S	-	S	-
Pyridine (50%)	U	-	U	-	S	-

# CHEMICAL RESISTANCE TABLE

## KEY:

S - Satisfactory

M - Moderate attack

U - Unsatisfactory

	Aluminium	Anodic coating for Aluminium	Delrin	Glass	Polypropylene	Stainless steel
Chemical						
Rubidium Chloride	M	-	S	-	S	-
Sodium Borate	S	-	S	-	S	-
Sodium Bromide	U	-	S	-	S	-
Sodium Carbonate (2%)	M	-	S	-	S	-
Sodium Chloride (10%)	S	-	S	-	S	-
Sodium Chloride (sat'd)	S	-	S	-	S	-
Sodium Dodecyl Sulfate	S	-	S	-	S	-
Sodium Hydroxide (<1%)	-	-	-	-	S	-
Sodium Hydroxide (10%)	U	-	U	-	S	-
Sodium Hypochlorite (5%)	U	-	U	-	S	-
Sodium Iodite	M	-	S	-	S	-
Sodium Nitrate	S	-	S	-	S	-
Sodium Sulfate	U	-	S	-	S	-
Sodium Sulfide	S	-	-	-	S	-
Sodium Sulfite	S	-	S	-	S	-
Stearic Acid	S	-	S	-	S	-
Sucrose	M	-	S	-	S	-
Sucrose Alkaline	M	-	S	-	S	-
Sulfosalicylic Acid	U	-	S	-	S	-
Sulfuric Acid (10%)	U	-	U	-	S	-
Sulphuric Acid (50%)	U	-	U	-	S	-
Sulphuric Acid (conc.)	S	-	U	-	S	-
Solution 555 (20%)	S	-	S	-	S	-
Tetrahydrofuran	S	-	U	-	M	-
Tris Buffer (neutral pH)	U	-	S	-	S	-
Toluene	S	-	M	-	M	-
Trichloroacetic Acid	U	-	U	-	S	-
Trichloroethane	-	-	-	-	U	-
Trichloroethylene	-	-	-	-	U	-
Trisodium Phosphate	-	-	M	-	S	-
Triton X-100	S	-	S	-	S	-
Urea	S	-	S	-	S	-
Xylene	S	-	M	-	U	-
Zinc Chloride	M	-	U	-	S	-
Zinc Sulfate	U	-	S	-	S	-

## **Test 13/16 via LED Display (not EB series)**

This series of tests allow you to check the various electronic controls.

CHECKS for: Tachometer, Imbalance Detector, Lid Sensor, Watchdog, EE Prom.

LED display and amplifier can be made via the keypad and LED display.

### **To access, follow these instructions:**

- Make sure the Centrifuge power is turned off and the centrifuge lid remains open.

Press the Pulse key on the front panel. Keep held down.

- Turn on the power.

When ‘test 13’ shows on the LED display, remove your finger from the pulse button.

- Press the time up button (7181 15 or later revision number will show)
- Press the time up button (EetSt will show)
- Press the speed up arrow (Pass should show)
- Press the time up arrow (8888 88 should show)

### **This is the LED segment test.**

- Press the speed up arrow to increment the sections.
- Press the time up arrow .18. (255 should show, or less ADC)

### **This is the temperature probe value.**

This is only applicable to the K2R version.

Values versus temperature are shown in a separate table for these models only.

- Press the time up arrow .19. (001 Or 101 should show)

### **These are the tests for Tachometer**

- rotate the motor to see the change 0-1. (left LED)
- Imbalance detector, push the motor side to side 0-1 change (right LED)
- Lid sensor, shut the lid 0-1 (middle LED)

### **Note for the K3 & R series only.**

- There is another display before the tachometer; this shows the rotor recognition sensor.
- Rotate the motor, 0-1 will show on the display (rotor must be fitted)
- Press the time up arrow. 20. (BuztSt should show)
- Press the speed up arrow to turn the buzzer (if fitted) on or off.
- Press the time up arrow .21. (dOGt St should show)

### **This is the watchdog circuit test.**

- Press the Speed up arrow to return to normal.
- HELLO should show on the display. You can now use the Centrifuge.

## **WARRANTY**

also

See separate document for UK  
See separate document for non UK

### **All models worldwide**

**1000 series . . . . . 1yr**

**2000 series . . . . . 2yrs**

**K series . . . . . 2yrs**

**KR series . . . . . 2yrs**



Distributed by:

Manufactured by:

**Centurion Scientific Ltd**  
Unit A2 Ford Airfield Industrial Estate,  
Ford, Arundel, West Sussex. BN18 0HY. UK

**Tel: +44 (0) 1903 721020**  
Fax: +44 (0) 1903 725496

e-mail: [info@centurionscientific.co.uk](mailto:info@centurionscientific.co.uk)

[www.centurionscientific.co.uk](http://www.centurionscientific.co.uk)